

Second Examination
Tuesday, October 4, 2011

Instructions: This exam should be done on your own paper. Your name should be on each sheet and on the back of the last sheet; the answers should appear written carefully and in order. If in doubt, show intermediate steps: Full credit may not be given, even for correct answers, unless work is arranged clearly and explained. This exam is closed book. You may leave after handing in your exam paper, but be sure to check your answers carefully. You may keep this exam sheet.

1. (10 points apiece) Compute the following definite and indefinite integrals. Show all of your work.

(a) $\int_0^\pi x \sin(2x) dx$ (b) $\int \frac{1}{x^2 + 3x + 2} dx$ (c) $\int \frac{1}{x^2 + 4x + 29} dx$
(d) $\int_{-1}^1 \sqrt{1 - x^2} dx$

2. (20 points total) Consider $\int_0^2 x^2 + 3x + 2 dx$.

- (a) Compute the integral using one application of Simpson's rule over the entire interval. Express your result as an exact fraction.
(b) Compute the integral exactly by taking an antiderivative of the integrand and using the fundamental theorem of calculus. Express your result as an exact fraction.
(c) Compare the exact value to the value you obtained by Simpson's rule. What do you find? Why do you think this is so?

3. (10 points apiece) Calculate the following integrals, if they converge. If an integral doesn't converge, explain why it doesn't.

(a) $\int_0^\infty \frac{1}{(x+2)^2} dx$ (b) $\int_{-2}^2 \frac{1}{(x+2)^2} dx$ (c) $\int_1^\infty \frac{1}{\sqrt{x}} dx$
(d) $\int_0^1 \frac{1}{\sqrt{x}} dx$